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AUTHOR Holtzman, Wayne H.
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ABSTRACT

The current emphasis on quality in education began with the launching of Sputnik in 1958. This led to the realization that all was not well and to the era of massive government grants to aid education. Great advances in technology and new dimensions for one practical field of psychology, education, have profound ramifications for students, teachers, and society in general. Great strides are being made in the field of individualized instruction, taking into account the many human diversities. Ten years hence technology, given adequate research and development funds, will be at such an advanced state that there will be even greater computer-individual interaction. This technology will provide the flexibility to change radically the social organization and atmosphere of our schools. Naturally, the role of the teacher will have to change in such a situation. It is clear that this psychotechnology, while not only having a major impact on education, will also have a major impact on psychology itself, resulting in a profound identity crisis in psychology by 1980. (CK)

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NEW DIMENSIONS FOR PSYCHOLOGY IN EDUCATION[1]

Wayne H. Holtzman

The University of Texas

Society expects a great deal from psychology and the behavioral sciences in finding solutions to pressing problems while failing to support the human sciences well enough to achieve their potentialities. Such contradictions between expectation and support are hardly limited to psychology. Most relatively new fields of human endeavor suffer the same frustrations. I suspect the chief difficulty lies in our inability to change social structures, to give up outmoded traditions, and to cope with vested interests, rather than our inability to visualize new ways of managing and developing our human resources.

In spite of such inertia, the next ten years offer unusual opportunities for psychology and psychotechnology to serve mankind. In many instances these opportunities represent new dimensions for psychology that most of us are only beginning to appreciate. Let's explore in more detail some significant new developments in just one field of application, the field of education.

National concern for the improvement of education at all levels has grown rapidly in recent years. The current emphasis upon quality in education began in the post-Sputnick period when we were shocked into

TM 000 276

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the realization that all was not well. The idea of universal education of high quality for every individual student is a dream that few of us wish to set aside -- a dream that paradoxically seems more remote at the same time great progress is being made in the development of new technology to make it possible.

Entrance by the federal government into the support of education on a large scale introduces a significant new dimension to education which has profound ramifications for psychology in particular and the behavioral sciences in general. How should the schools be organized and controlled politically? Under what conditions does school integration fail to achieve the desired goals? What are the causes of student unrest? What new skills must be acquired by teachers and what new roles must they assume if we are to raise the quality of instruction for everyone? When should children enter school and can we do anything about the poor environment of prescchool children in many families? How can we reduce the number of dropouts? Can our curriculum be improved dramatically by major revision incorporating psychological principles of motivation, learning, and human development? Can we really take into account individual differences across children and develop programs that truly realize the potentialities of each individual? These questions are not new, but psychology's role in dealing with them is potentially very great.

One area in which great strides are being made concerns the development of individualized instruction that takes into account the great human diversity in cultural background, styles of life, values, goals, motivation, mental abilities, and personality of students. To keep track of a person moving at his own pace in a continuous progress environment

where the particular branching of the curriculum is tailor-made for his own learning aptitudes and level, requires a computer to manage the curriculum and assist with the instruction. Emphasis is upon the learner rather than the teacher. The teacher may be necessary for learning under some circumstances and may actually be a hindrance under others. The student begins at that point in the curriculum where he is best capable of learning and moves at his own rate with his behavior being reinforced -- rewarded or disapproved -- immediately following his answer. The particular sequence of the curriculum may be controlled almost entirely by a computer or it may be completely under the control of the student, depending on the type of material to be learned, the kind of student, and the purposes of the instruction.

An important first step in the development and implementation of new technology is the preliminary sketching of a design for the future. Given existing technology, current trends in society, and probable developments in the near future, what might instruction look like in ten years, provided there is sufficient support of the necessary research, development, and transfer of new technology on a large scale basis? Let's imagine for a minute what this educational environment might be, given existing technology and likely developments in the near future.

Responsive environments for learning could begin at infancy in the home as well as in special day-care centers. Many children could be grouped from the age of three on and there would be no sudden entry into school. Most instruction would be individualized with a continuous diagnosis-prescription-evaluation cycle so that the student could gain mastery of basic skills as efficiently as possible. Learning resource centers with computerized libraries and communications controls would be the

center of education just as the library is the center of knowledge within our great universities. Study carrels or teaching terminals, however, would be remotely located for the convenience of students.

The lock-step, self-contained classroom would gradually disappear. While we would still have lectures from distinguished speakers as well as demonstrations and multi-media presentations for large groups, the current classroom scheduling system and sequence of courses on a semester or annual basis could be largely replaced as the uniformly prescribed curriculum disappears. Computers would take over most of the drudgery of scheduling classes, allocating learning resources to individuals and groups, maintaining progress records while preserving their confidentiality where appropriate, compiling and scoring tests, providing easy access to files of information for reference or guidance by students and teachers, and a host of other management activities. For major segments of the curriculum, the computer would also provide direct interaction between the student and the subject-matter to be learned, whether the instruction involved drill and practice in arithmetic or foreign language, tutorial interaction and dialogue, or problem solving and simulation of complex phenomena.

Most of the interaction between the computer and the individual would occur at remotely located inquiry terminals or teaching stations. A typical terminal would consist of a visual display device, perhaps an ordinary television screen, for presenting both moving pictures and still images to the student. In some cases, provision would be made for graphic or schematic material to be superimposed locally on visual images received from afar. Video-tape recording/playback features would be present at the terminal, making it possible to shift quickly and economically from

one segment of the instructional module to another, repeating where necessary. The terminal would also have audio output in the form of segmented speech, probably generated locally from random-access storage in harmony with the visual display. Limited capability would be present for generating short spoken phrases and sentences in a tutorial dialogue with the student.

The student would communicate with the curriculum material by either typing on a simple keyboard or pressing a pen at the desired location on the face of the visual display. He would be able to draw lines with the pen across the visual image as well as specific points, and the computer would interpret the graphical input before producing an appropriate response to the student. A hard copy of the dialogue or portions of the computer output could be obtained from the typewriter, from a photograph of the visual display, or later from the computer storage unit before it was erased. Sensory-motor aids would be available at the learning terminal for the blind, deaf, or physically handicapped person. Children with specific kinds of learning disabilities would have special types of individual instruction at the learning terminal as well as intensive tutoring in small groups.

Many of the hardware components for a prototype terminal similar to the one described above are close to completion now. Existing systems for computer-assisted instruction already have some of these features. And several major companies are now designing hardware configurations that will eventually have the functional capabilities outlined above. It is now fairly certain that the cost of such a system can be sharply reduced by mass-production to the point where it is economically feasible to think of large-scale implementation.

Significant steps toward the ideal of individualized instruction have been taken recently in a number of educational settings that have been widely publicized. Psychological laboratories for computer-assisted instruction at Stanford, Texas, Illinois, Pittsburgh, Florida State, System Development Corporation, the Mitre Corporation, and a dozen other universities and research institutes have already demonstrated the feasibility of this new technology as well as its dramatic impact upon individual learning in many areas. But these are only a small beginning compared to what must be done in the way of research and development before individualized instruction in the true sense of the term can be properly implemented on a large scale.

In the meantime, other forms of individualized instruction developed by psychologists and educators are making real headway. Rate of learning, amount of practice, and preferred mode of instruction have been adapted to the individual in the new programs of Individually Prescribed Instruction developed by Robert Glaser and associates at the University of Pittsburgh's Learning Research and Development Center and disseminated by Research for Better Schools, Incorporated, of Philadelphia. The child works independently in most cases, building up his sense of responsibility and confidence in his own knowledge. A specific lesson plan is prescribed individually for each child every day, depending upon his performance and desires of the previous day. Thousands of curriculum modules are stored and retrieved manually by clerks at the end of each day until the experimental system is perfected and stored electronically in computers.

Project PLAN represents still another successful prototype for individualized instruction, guidance, and career planning. Developed

jointly by John Flanagan and his associates at the American Institutes for Research and by Westinghouse Learning Corporation, Project PLAN consists of over a thousand lessons, or modules, divided across nine operating grades and four subject-matter areas. Last year nearly ten thousand students in 17 school systems across the country took individualized programs of study. Each teaching unit is coded as to reading difficulty, required teacher supervision, media richness, required social involvement, and a number of other characteristics. A profile is prepared for each student containing measures of abilities, interests, aspirations, and background data for use by the computer in matching the curriculum to the student. Computer-generated decisions can always be countermanded by the teacher who supervises the student's work. Experience to date indicates that most students and teachers like the new freedom provided by PLAN, and that learning proceeds at a faster pace.

Modularized programs of individualized instruction provide the flexibility needed to change radically the social organization and atmosphere of our schools. When pursued to their logical conclusion, such programs could erase the distinctions between formal and informal learning, between institutionalized classrooms and correspondence courses, between the home, the job, and the school as centers of learning. It is still too early to perceive the ultimate restructuring of education, even ten years hence, since there are many unknowns concerning the new technology. Nevertheless, it is reasonably certain that the role of the classroom teacher will change considerably. Instead of being a generalist who has to deal with every aspect of classroom learning, the future teacher will tend to choose a more specialized role as an applied psychologist, a personal counselor, a behavior therapist, a specialist in

coping with unusual learning disabilities, an educational engineer, a computer technologist, a media technician, or a human relations specialist dealing with group processes. Group activities will continue to be an essential part of most educational programs, requiring teachers who are especially sensitive to different life styles and the need to stimulate individuals by using appropriate behavioral techniques in the classroom. Mastery of subject matter such as mathematics or literature will continue to be important for many teachers although the basic modules of the curriculum will be developed and refined elsewhere.

Efforts are underway in several research centers to develop improved methods of teacher education to prepare prospective teachers for anticipated changes in the classroom and to provide appropriate in-service education for existing teachers. Under the leadership of Robert Peck and Oliver Bown, the Research and Development Center for Teacher Education at The University of Texas is developing a whole series of modular, individualized units for personalizing teacher education. One package of materials has been developed for assessment of personal characteristics that facilitate or inhibit different styles of effective teaching. The prospective teacher is given psychological and behavioral feedback and interpretative counseling, using information from personality tests, observations in microteaching situations, and teacher-child interaction variables from videotaped recordings of the individual's performance in actual classroom situations. Other modules are being developed to train teachers in evaluative, prescriptive, and classroom-management roles. Throughout these exercises, special attention is given to personalizing the experiences of each prospective teacher, taking into account her

personal characteristics as well as the demands that are likely to be made upon her in different teaching situations. Self-paced in nature, the modules are adaptable to a variety of teacher education programs. Psychologists within the Center are also involved in assisting curriculum specialists in the development of behaviorally defined, empirically evaluated modules dealing with subject-matter areas.

While it is clear that psychotechnology can have a major impact upon education, it may not be so apparent that the forthcoming changes in education will have a major impact upon psychology. By 1980, psychology as we know it today will undergo a serious identity crisis. How will the millions of educational technologists, counselors, specialists in learning problems, behavior therapists, and teachers who have mastered certain psychological skills be distinguished from the subdoctoral psychotechnician and applied psychologist? Psychology as a science and profession must be prepared to cope with the rapidly rising number of specialists who rely heavily upon psychology and the related behavioral sciences for development of their own technologies.

The recent report by the Behavioral and Social Sciences Survey Committee published by the National Academy of Sciences has a number of specific recommendations, most of which would greatly expand and alter the nature of psychology if implemented. It is worth noting that 94 per cent of the behavioral scientists on the faculties of schools of education are psychologists, a unique position of dominance among various professional schools in our universities. In addition, many psychologists in other schools are devoting most of their energies to the fields of learning, development, measurement, and interpersonal relations -- fields that are basic to educational reform.

In modern society, knowledge and accompanying credentials constitute a source of power that is open primarily to individuals who progress satisfactorily through the formal educational system. On the basis of a major study of the "Learning Force" over a 30-year period, Stanley Moses at the Syracuse Educational Policy Research Center estimates that the number of individuals engaged full-time in the formal educational system will grow from 64 million in 1970 to 67 million in 1976, only a slight rise. But the number engaged in the educational periphery, ranging from anti-poverty programs to educational television, will rise sharply from 60 to 82 million in only six years. By 1976 the total number of persons in the Learning Force will reach 150 million, more than than the entire population of the United States only a generation ago. Given the great importance of education in our changing society, any improvement in the efficiency of learning by the application of new technology is indeed significant.

Contrary to the skeptical criticism of some alarmists, there is no reason to believe that this new technology will necessarily dehumanize man. There are many things in this world that can be done better by machines than by human beings. The advent of the computer, and educational technology related to it, clearly points the way to major changes in education which will free the individual, both teacher and student, to interact in more human ways than ever before.